

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/JP2004/009375

International filing date (day/month/year)
25.06.2004

Priority date (day/month/year)
26.06.2003

International Patent Classification (IPC) or both national classification and IPC
G03F1/14, G03F7/20

Applicant
CANON KABUSHIKI KAISHA

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☒ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/JP2004/009375

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ in written format
 - ☐ in computer readable form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/JP2004/009375

Box No. II Priority

1. ☒ The following document has not been furnished:

☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).

☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(I) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	
	No: Claims	1-14
Inventive step (IS)	Yes: Claims	
	No: Claims	1-14
Industrial applicability (IA)	Yes: Claims	1-14
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VI Certain documents cited

1. Certain published documents (Rules 43*bis*.1 and 70.10)

and / or

2. Non-written disclosures (Rules 43*bis*.1 and 70.9)

see form 210

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Prior Art Documents:

Reference is made to the following documents:

- D1:** ALKAISI M M ET AL: "NANOLITHOGRAPHY IN THE EVANESCENT NEAR FIELD" ADVANCED MATERIALS, VCH VERLAGSGESELLSCHAFT, WEINHEIM, DE, vol. 13, no. 12/13, 4 July 2001 (2001-07-04), pages 877-887, XP001130146 ISSN: 0935-9648
- D2:** MCNAB S J ET AL: "Analytic study of gratings patterned by evanescent near field optical lithography" JOURNAL OF VACUUM SCIENCE & TECHNOLOGY B: MICROELECTRONICS PROCESSING AND PHENOMENA, AMERICAN VACUUM SOCIETY, NEW YORK, NY, US, vol. 18, no. 6, November 2000 (2000-11), pages 2900-2904, XP012008487 ISSN: 0734-211X
- D3:** XIANGANG LUO ET AL: "Surface plasmon resonant interference nanolithography technique" APPLIED PHYSICS LETTERS AIP USA, vol. 84, no. 23, 22 April 2004 (2004-04-22), pages 4780-4782, XP002294549 ISSN: 0003-6951
- D4:** US-B-6 171 7301 (IKEDA TSUTOMU ET AL) 9 January 2001 (2001-01-09)
- D5:** WO 03/001869 A (CALIFORNIA INST OF TECHN) 9 January 2003 (2003-01-09)
- D6:** US 2001/046719 A1 (KURODA RYO ET AL) 29 November 2001 (2001-11-29)

2. Clarity Objections under Article 6:

- 2.1** Although **claims 1-4 and 14** have been drafted as separate independent product claims they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought or in respect of the terminology used for the features of that subject-matter. The aforementioned claims therefore lack conciseness. Moreover, lack of clarity of the claims as a whole arises, since the plurality of independent claims makes it difficult, if not impossible, to determine the matter for which protection is sought, and places an undue burden on others seeking to establish the extent of the protection.

Hence, abovementioned claims do not meet the requirements of Article 6 PCT.

The same argumentation applies to independent method **claims 7-9, 11 and 13**.

In order to overcome this objection, it would appear appropriate to file an amended set of claims defining the relevant subject-matter in terms of a single independent claim in each category followed by dependent claims covering features which are merely optional (Rule 6.4 PCT).

- 2.2 Furthermore, **claims 1 and 5** do not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not clearly defined.

claim 1: the term "eccentric model" is not supported by the description, since the description only alludes to a "concentric-circle model" for the simulation of the electric field distribution. Furthermore, the meaning of the term *eccentric* (i.a. "not having the same center; the opposite of concentric") is in contradiction to the technical term *concentric-circle* simulation model that was mentioned in the description.

claim 5: the subject-matter of claim 5 is unclear, in that the surface plasmon polaritons, which are excited in the light blocking member of the mask are *not monochromatic*. In fact there is a wavelength *spectrum* of surface plasmon polariton modes excited in said layer. Therefore, the technical expression "the pitch is made not greater than *the* wavelength of a surface plasmon polariton wave ..." is unclear.

- 2.3 Product by process claim: independent **claim 1** defines a product (a near-field exposure mask) in terms of the simulation process by which the product is designed, but the claim as a whole is directed to the product. Such a claim lacks novelty if a prior art exposure mask, even if designed by an undisclosed simulation process, appears to be inherently the same as, or indistinguishable from, the claimed near-field exposure mask (see novelty objection under 3.1).

Therefore, the claims have to be amended to clarify the subject-matter.

3. Novelty Objections under Article 33(2):

3.1 INDEPENDENT CLAIM 1:

Document D1, which relates to evanescent near-field optical lithography (ENFOL) is regarded as being the closest prior art to the subject-matter of **claim 1**, and discloses (the references in parentheses applying to this document):

An exposure mask for exposing an image forming layer provided on a substrate, by use of near-field light leaking from adjoining openings formed in a light blocking member (see Figures 1 and 2).

Since the exposure mask from document D1, that has been designed by use of a two-dimensional multiple-multipole simulation program (MMP), can *not be distinguished* from the claimed exposure mask (see clarity objection under 2.3), the subject-matter of claim 1 cannot be considered to be new over the disclosure of document D1, Article 33(2) PCT.

3.2 INDEPENDENT CLAIM 2:

Furthermore, D1 discloses a near-field exposure mask that fulfills the following relation: $K \geq W + 2T$ (see Figure 5b and page 880: linewidth of the pattern in the resist: $W \approx 50\text{nm}$; width of the light blocking member $K = 210\text{nm}$; height of the pattern to be produced by use of the image forming layer $T \approx 60\text{nm}$.)

Therefore, claim 2 cannot be considered to be new over the disclosure of document D1, Article 33(2) PCT.

3.3 INDEPENDENT CLAIMS 3 and 4:

The same reasoning as mentioned under 3.2 applies, *mutatis mutandis*, to the subject-matter of the corresponding independent claims 3 and 4 (see document D1; Pitch $P = 280\text{nm}$; $D = 70\text{nm}$ Figure 5b), which therefore are also considered not new.

3.4 INDEPENDENT CLAIMS 7-9, 11, 13, 14:

Independent **claims 7-9, 11, 13 and 14** do not introduce any supplementary features and hence do not add anything of novel and inventive significance to the subject-matter of the previously discussed independent claims (see novelty objections under 3.1 - 3.3). Hence, the subject-matter of said claims cannot be considered to be new over the disclosure of document D1, Article 33(2) PCT.

It is noted that **alternative patentability objections** could apparently be based on **D2-D3** as indicated in the search report.

3.5 Dependent claims 5, 6, 10 and 12 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, see documents D1-D3 and the

corresponding passages cited in the search report.

4. Industrial Applicability:

The subject-matter of the present application is being considered as susceptible of industrial application according to Article 33(4) PCT.

Re Item VI

Certain documents cited

Certain published documents

Application No Patent No	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
XP002294549	21/05/2004	----	----

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